06/09/04

AF/2834

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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	09/817,559
Filing Date	March 26, 2001
First Named Inventor	C. Theodore Peachee et al.
Art Unit	2834
Examiner Name	Julio C. Gonzalez
Total Number of Pages in This Submission	Attorney Docket Number: 3174-000003

ENCLOSURES ***(check all that apply)***

- ☒ Fee Transmittal Form
  - ☒ Fee Attached
- ☐ Amendment / Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
- ☐ Certified Copy of Priority Document(s)
- ☐ Response to Missing Parts/ Incomplete Application
  - ☐ Response to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert to a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s) _____
- ☐ After Allowance Communication to Technology Center (TC)
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☒ Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- ☐ Proprietary Information
- ☐ Status Letter
- ☒ Other Enclosure(s) *(please identify below)*:

  Appellant's Brief (in triplicate); and Return Postcard.

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SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Harness, Dickey & Pierce, P.L.C.	Attorney Name: Michael D. Wiggins	Reg. No.: 34,754
Signature	Michael D Wiggins		
Date	June 8, 2004		

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FEE TRANSMITTAL for FY 2004

Effective 10/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 330

Complete if Known	
Application Number	09/817,559
Filing Date	March 26, 2001
First Named Inventor	C. Theodore Peachee et al.
Examiner Name	Julio C. Gonzalez
Art Unit	2834
Attorney Docket No.	3174-000003

METHOD OF PAYMENT *(check all that apply)*

☒ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☒ Deposit Account:

Deposit Account Number: 08-0750

Deposit Account Name: Hamess, Dickey & Pierce, P.L.C.

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FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	770	2001	385	Utility filing fee	
1002	340	2002	170	Design filing fee	
1003	530	2003	265	Plant filing fee	
1004	770	2004	385	Reissue filing fee	
1005	160	2005	80	Provisional filling fee	

SUBTOTAL (1) ($) 0

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

			Extra Claims		Fee from below		Fee Paid
Total Claims		-20 **	= 0	X		=	0
Independent Claims		-3 **	= 0	X		=	0
Multiple Dependent				X		=	0

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	86	2201	43	Independent claims in excess of 3
1203	290	2203	145	Multiple dependent claim, if not paid
1204	86	2204	43	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 0

***or number previously paid, if greater; For Reissues, see above*

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	420	2252	210	Extension for reply within second month	
1253	950	2253	475	Extension for reply within third month	
1254	1,480	2254	740	Extension for reply within fourth month	
1255	2,010	2255	1,005	Extension for reply within fifth month	
1401	330	2401	165	Notice of Appeal	
1402	330	2402	165	Filing a brief in support of an appeal	330
1403	290	2403	145	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive – unavoidable	
1453	1,330	2453	665	Petition to revive – unintentional	
1501	1,330	2501	665	Utility issue fee (or reissue)	
1502	480	2502	240	Design issue fee	
1503	640	2503	320	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17 (q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	770	2809	385	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	770	2810	385	For each additional invention to be examined (37 CFR § 1.129(b))	
1801	770	2801	385	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 330

SUBMITTED BY Complete *(if applicable)*

Name (Print/Type)	Michael D. Wiggins	*Registration No. (Attorney/Agent)*	34,754	*Telephone*	248-641-1600
Signature				*Date*	June 8, 2004

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appeal No. _____

Application No.:	09/817,559
Filing Date:	March 26, 2001
Applicant:	C. Theodore Peachee et al.
Group Art Unit:	2834
Examiner:	Julio C. Gonzalez
Title:	SENSORLESS SWITCHED RELUCTANCE MACHINE WITH SEGMENTED STATOR
Attorney Docket:	3174-000003

Mail Stop Appeal Brief- Patents
Director of The United States Patent and Trademark Office
P.O. Box 1450
Alexandria, Virginia 22313-1450

APPELLANT'S BRIEF

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BRIEF ON BEHALF OF APPELLANT

This is an appeal from the action of the Examiner dated December 16, 2003, finally rejecting claims 1, 2, 4 – 8, 10 – 12, 14 – 18, 20 – 23 and 25 – 27 and objecting to claims 3, 9, 13, 19 and 24.

I. REAL PARTY IN INTEREST

The real party in interest in the present application is Emerson Electric Co. (Assignee).

II. RELATED APPEALS AND INTERFERENCES

There are presently two related appeals which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal. These appeals include U.S. App. Serial No. 09/824,980, filed April 3, 2001 (Notice of Appeal filed March 31, 2004) and U.S. App. Serial No. 09/803,876, filed March 12, 2001 (Notice of Appeal filed April 8, 2004).

III. STATUS OF THE CLAIMS

Claims 1, 2, 4 – 8, 10 – 12, 14 – 18, 20 – 23 and 25 – 27 stand finally rejected and claims 3, 9, 13, 19 and 24 stand objected to.

IV. STATUS OF AMENDMENTS

All of the amendments have been entered in this application.

V. SUMMARY OF THE INVENTION

The present invention provides a switched reluctance electric machine having a stator including a plurality of circumferentially-spaced stator segment assemblies that include a stator segment core. Winding wire is precisely wound around individual ones of the stator segment core to provide substantially uniform inductance and resistance characteristics. The windings define a slot fill that is greater than 65%. A rotor defines a plurality of rotor poles. The rotor tends to rotate relative to the stator to maximize the inductance of an energized winding. A sensorless drive circuit derives rotor position based on parameters that vary with at least one of the substantially uniform inductance and resistance characteristics of the stator segment assemblies. The sensorless drive circuit energizes the winding wire around the stator segment assemblies to control operation of the switched reluctance machine based on the derived position of the rotor.

In one feature, the sensorless drive circuit includes an inductance sensor that senses inductance of the winding wire of one of the stator segment assemblies. The sensorless drive circuit derives the rotor position from the sensed inductance.

In another feature, the sensorless drive circuit determines rotor position by monitoring a slope of a current waveform related to current flowing in the energized winding and by identifying when the slope is zero.

In still another feature, the sensorless drive circuit monitors current and flux and employs a look up table to determine the derived position of the rotor based on the current and the flux.

VI. ISSUES

A. Whether the combination of Tang '905 in view of Takeuchi et al. '387, Oki (JP 411 289 701) and Ehsani '235 establish a prima facie case of obviousness under 35 U.S.C. § 103(a), with respect to claims 1, 2, 6 – 8, 11, 12, 16 – 18, 21 – 23 and 26.

B. Whether the combination of Tang '905, Takeuchi et al. '387, Oki (JP 411 289 701) and Ehsani '235 as applied to claims 1, 11 and 21 and further in view of Moriarity (US 2001/0010452), establish a prima facie case of obviousness under 35 U.S.C. § 103(a), with respect to claim 27.

C. Whether the combination of Tang '905, Takeuchi et al. '387, Oki (JP 411 289 701) and Ehsani '235 as applied to claims 1 and 11 and further in view of Mann et al. '053, establish a prima facie case of obviousness under 35 U.S.C. § 103(a), with respect to claims 4, 5, 14 and 15.

D. Whether the combination of Tang '905, Takeuchi et al. '387, Oki (JP 411 289 701) and Ehsani as applied to claims 1 and 11 and further in view of Akita et al. '687, establish a prima facie case of obviousness under 35 U.S.C. § 103(a), with respect to claims 10, 20 and 25.

E. Claims 3, 9, 13, 19 and 24 define over the prior art.

VII. GROUPING OF CLAIMS

Claims 1, 2 and 4 – 8 stand or fall together as set forth in sections A and C of the following arguments.

Claims 3, 9 and 10 stand or fall by themselves as discussed in sections D and E of the following arguments.

Claims 11, 12 and 14 – 18 stand or fall together as set forth in sections A and C of the following arguments.

Claims 13, 19 and 20 stand or fall by themselves as discussed in sections D and E of the following arguments.

Claims 21 – 23, 25 and 26 stand or fall together as set forth in sections A and D of the following arguments.

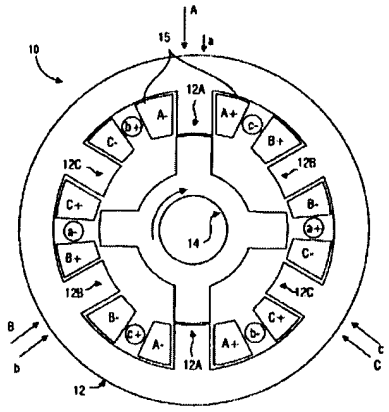
Claim 27 stands or falls by itself as set forth in section B of the following arguments.

VIII. ARGUMENTS

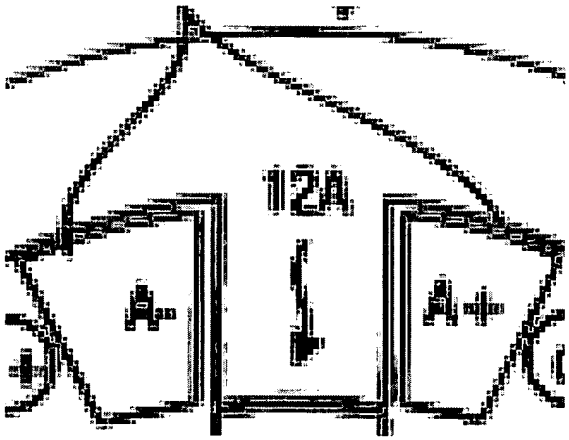
A. The combination of Tang '905 in view of Takeuchi et al. '387, Oki (JP 411 289 701) and Ehsani '235 does not establish a prima facie case of obviousness under 35 U.S.C. § 103(a), with respect to claims 1, 2, 6 – 8, 11, 12, 16 – 18, 21 – 23 and 26.

At the outset, Applicants note that claims 1, 11 and 21 each include a segmented stator of a switched reluctance electric machine including a plurality of stator segment assemblies that each have a stator core, wherein the stator core is wound to provide a slot fill of greater than 65%. Further, claims 1, 11 and 21 each include a sensorless drive circuit that derives rotor position based on parameters that vary with at least one of the substantially uniform inductance and resistance characteristics of the stator segment assemblies.

Applicants note that Tang does not show, teach or suggest a switched reluctance machine with a segmented stator, as admitted by the Examiner. Tang also does not show, teach or suggest a stator having a slot fill that is greater than 65%. The Examiner has asserted that Figure 1 of Tang, recreated below, inherently shows a switched reluctance motor with a slot fill above 65%.



Applicants respectfully assert that Figure 1 does not inherently show slot fill that is greater than 65%. More specifically, the drawing is in schematic form and does not appear to show relative sizes. For example, the windings are not uniformly wound around the stator teeth. In particular, A- and A+ have different sizes and are not symmetric, which would be impossible since the same winding wire that is used to wind A+ would also form A-. An enlarged view of A+ and A- is set forth below:



Further, the specification of Tang is silent as to slot fill. Figure 1 of Tang also shows large gaps (labeled a+, a-, b+, b-, c+, and c-), which do not include winding wire and would reduce the slot fill percentage. Since the stator is not segmented, Applicants presume that either needle winding or transfer winding methods would be used to wind the stator. Neither of these approaches achieve slot fills that are greater than 65%.

Applicants Specification ¶ [0015]. At best, Tang could achieve 60-65% slot fill with the transfer winding approach discussed by Applicants. **Id.**

Furthermore, claims 1, 11 and 21 do not claim high slot fill alone, but claim high slot fill in combination with a segmented stator switched reluctance machine. By enabling the stator segments to be wound before assembly, which can only be achieved using segmented stators, the electrical uniformity of the inductance and resistance values of the stator poles is improved. This combination enables the drive circuit to determine the rotational position of the rotor without sensors.

Takeuchi et al. does not show, teach or suggest a switched reluctance machine. Takeuchi et al. relates to permanent magnet machines, not switched reluctance machines.

Oki does not show, teach or suggest a stator having a slot fill that is greater than 65%. Oki also does not expressly address switched reluctance machines. The Examiner incorrectly characterizes Oki by stating that "Oki teaches ... for the purpose of making a motor with superior electromagnetic performance that a reluctance motor may be made by having a segmented stator." **Final Office Action at p. 3.** In support of this statement, the Examiner relies upon Figure 4 of Oki, which admittedly shows a segmented stator. However, the text of Oki specifically states that the stator was segmented to make the assembly/manufacturing of the machine easier. Oki states:

> Accordingly, due to the fact that the stator is divided for each electrode unit, it is possible to readily carry out the coil-winding operation for each layered core, so as to enhance the efficiency of producing reluctance motors.

Oki translation at pp. 3-4. Therefore, Oki segments the stator to make manufacturing easier – not to improve the electromagnetic characteristics of the switched reluctance

machine or to make the sensorless approach easier to implement. Further, Oki fails to teach or suggest increasing the slot fill beyond the percentage that could be obtained using a non-segmented stator. The only portion of Oki that relates to improving electromagnetic performance is the removal of caulking and welding of the stator laminations.

It should be further noted that the combination of features provided in each of claims 1, 11 and 21 provide particular advantages that are unique to switched reluctance machines. Sensorless control of brushless permanent magnet machines and induction machines currently do not operate properly if the iron core is heavily saturated with magnetic flux. **Dr. Wallace Declaration at Paragraph 5, submitted with Amendment 2/24/03**. Switched reluctance machines, on the other hand, are frequently operated with levels of magnetic flux in their iron cores that exceed the levels used in other types of electric machines. **Id.** at paragraph 6. Sensorless control systems for switched reluctance machines do operate properly if the iron core is heavily saturated with magnetic flux. **Id.**

By segmenting the stator and increasing slot fill of the switched reluctance machine, the diameter of the winding wire can be increased using the same number of turns. **Id.** at paragraph 7. The increased diameter of the winding wire allows increased current to be driven through the windings, which increases torque output. **Id.** at paragraph 8. The increased current levels also increase magnetic loading and magnetic saturation. **Id.** at paragraph 9. Therefore, the benefits of a segmented stator in combination with a high slot fill are unique to switched reluctance machines with sensorless drive circuits as claimed in independent claims 1, 11 and 21.

With regard to the rejections of claims 1, 11 and 21 in general, the Examiner incorrectly relies on **In re Fine**, 5 U.S.P.Q.2d, 1596 (CAFC 1988) and **In re Jones**, 21 USPQ.2d 1941 (Fed. Cir. 1992). The facts and the holdings of these cases do not support the Examiner's conclusion under §103. More specifically, in both **In re Fine** and **In re Jones**, the CAFC reversed the Board and the Examiner based upon the Examiner's unsupported reliance upon the general knowledge of one skilled in the art. As in the instant case, the Examiners in both **In re Fine** and **In re Jones** combined features of two references in the same broad category of art and relied upon the general knowledge of one skilled in the art in making the combination. As in the instant case, the Examiners in **In re Fine** and **In re Jones** did not support the combinations by identifying specific teachings, suggestions or motivations found in the references.

Both **In re Fine** and **In re Jones** reject the proposition that the teaching, suggestion or motivation required by §103 is present simply because the references all relate to the same broad category of art or that unsupported general knowledge of one skilled in the art can be relied upon. The Examiner is essentially asserting that it would be obvious for skilled artisans to try the features of one device in another similar device. The CAFC expressly rejected the "obvious to try theory" in **In re Fine** at 1598.

The unsupported reliance on the general knowledge of one skilled in the art that was made by the Examiner here is exactly the type of conclusion that supported the reversal of the Board and the Examiner by the CAFC in both **In re Fine** and **In re Jones**. In supporting the combination, the Examiner states that the references "are well in the field of electric machines." **Final Office Action** at paragraph 5. The Examiner goes on to state:

> In response to applicant's arguments that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining and modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See In re Fine, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988) and In re Jones, 958 F.2d 347, 21 USPQ.2d 1941 (Fed. Cir. 1992). **In this case, the references deal with electric machines, especially motors and improvements of such machines.**

Final Office Action at paragraph 5 (Emphasis added). In summary, the only teaching, suggestion, or motivation that is relied upon by the Examiner is simply that the references all relate to electric machines.

The Examiner's reasoning is exactly the type of speculation that formed the basis for reversal of the Examiner and the Board in **In re Jones**:

> Conspicuously missing from this record is any evidence, other than the PTO's speculation (if it be called evidence) that one of ordinary skill in the herbicidal art would have been motivated to make the modifications of the prior art salts necessary to arrive at the claimed 2-(2 '-aminoethoxy) ethanol salt... We conclude that the PTO did not establish a prima facie case of obviousness.

In re Fine also rejected this reasoning. The prior art reference related to a similar device – namely gas chromatographs. **Id.** The prior art chromatograph detected sulfur while Applicants' chromatograph detected nitrogen. **Id.**

In view of the foregoing, the combination of the references is improper and otherwise fail to teach or suggest all of the elements of the claim, as set forth. Therefore, Applicants respectfully request that this Board overturn the Examiner's rejection of claims 1, 11 and 21.

With regard to claims 2, 6 – 8, 12, 16 – 18, 22, 23 and 26, Applicants note that each ultimately depend from one of claims 1, 11 and 21, which define over the prior art, as discussed in detail above. Therefore, claims 2, 6 – 8, 12, 16 – 18, 22, 23 and 26 also define over the prior art. Accordingly, Applicants respectfully request that this Board overturn the Examiner's rejection of claims 2, 6 – 8, 12, 16 – 18, 22, 23 and 26.

B. The combination of Tang '905, Takeuchi et al. '387, Oki (JP 411 289 701) and Ehsani '235 as applied to claims 1, 11 and 21 and further in view of Moriarity (US 2001/0010452), does not establish a prima facie case of obviousness under 35 U.S.C. § 103(a), with respect to claim 27.

Applicants incorporate the above discussion regarding claims 1, 11 and 21. Applicants note that claim 27 depends from claim 21, which defines over the prior art, as discussed in detail above. Therefore, claim 27 also defines over the prior art. Accordingly, Applicants respectfully request that this Board overturn the Examiner's rejection of claim 27.

C. The combination of Tang '905, Takeuchi et al. '387, Oki (JP 411 289 701) and Ehsani '235 as applied to claims 1 and 11 and further in view of Mann et al. '053, does not establish a prima facie case of obviousness under 35 U.S.C. § 103(a), with respect to claims 4, 5, 14 and 15.

Applicants incorporate the above discussion regarding claims 1, 11 and 21.

Claims 4, 5, 14 and 15 are each directed toward a switched reluctance electric machine. Mann et al. does not show, teach or suggest a switched reluctance machine, but instead specifically relates to permanent magnet electric machines.

As similarly discussed in detail above, the Examiner incorrectly relies on **In re**

Fine and **In re Jones** in applying Mann et al. As previously noted, both **In re Fine** and **In re Jones** reject the proposition that the teaching, suggestion or motivation required by §103 is present simply because the references all relate to the same broad category of art or that unsupported general knowledge of one skilled in the art can be relied upon. The Examiner is essentially asserting that it would be obvious for skilled artisans to try the features of one device in another similar device. The CAFC expressly rejected the "obvious to try theory" in **In re Fine** at 1598.

In view of the foregoing, Applicants respectfully request that this Board overturn the Examiner's rejection of claim 27.

D. The combination of Tang '905, Takeuchi et al. '387, Oki (JP 411 289 701) and Ehsani '235 as applied to claims 1 and 11 and further in view of Akita et al. '687, does not establish a prima facie case of obviousness under 35 U.S.C. § 103(a), with respect to claims 10, 20 and 25.

At the outset, Applicant respectfully notes that claims 10, 20 and 25 provide that the stator plates of the stator segment core include radial and lateral slits and first and second central portions that are deformed to hold the stack of stator plates together. Claims 10, 20 and 25 do not relate to end caps.

The Examiner has asserted that Akita et al. teaches "ends caps ... being placed at ends of stator segments (see Figure 36) and that stator segments have central portions so as to hold the stator plates together". **Final Office Action** at paragraph 7.

Applicants assume that the Examiner has incorrectly asserted Akita et al. against claims 10, 20 and 25, because the subject-matter of the claims does not correspond to the grounds of rejection. Applicants believe that the Examiner's rejection is more

properly asserted against claims 9, 19 and 24, which presently stand objected to, as discussed in further detail below.

Applicants do note, however, that none of the prior art references, Akita et al. in particular, teach or suggest radial and lateral slits and first and second portions that are deformed to hold the stack together. Therefore, claims 10, 20 and 25 define over the prior art and Applicants respectfully request that this Board overturn the Examiner's rejection of claims 10, 20 and 25.

Although claims 9, 19 and 24 stand only objected to, Applicants will address claims 9, 19 and 24 in view of Akita et al. considering the apparent mistake in rejecting claims 10, 20 and 25, as discussed above. The Examiner has asserted that Akita et al. teaches end caps, referencing Figure 36. Figure 36, however, illustrates insulating bobbins and not end caps (col. 23, lines 29 – 42). Therefore, Akita et al. fails to disclose end caps and claims 9, 19 and 24 define over the prior art.

E. Claims 3, 9, 13, 19 and 24 define over the prior art.

Applicants incorporate the above discussion regarding claims 1, 11 and 21.

Claims 3, 9, 13, 19 and 24 stand objected to as being dependent upon a rejected base claim. Applicants note that claims 3, 9, 13, 19 and 24 ultimately depend from one of claims 1, 11 and 21, which define over the prior art, as discussed in detail above. Therefore, claims 3, 9, 13, 19 and 24 also define over the prior art.

Further, it has been noted above that Akita et al. is perhaps more properly applied to claims 9, 19 and 24. However, as discussed in detail above, Akita et al. discloses insulating bobbins and fails to disclose end caps.

In view of the foregoing, Applicants respectfully request that this Board overturn the Examiner's objections to claims 3, 9, 13, 19 and 24.

IX. CONCLUSION

In view of the above presented discussion, Applicants believe that the pending claims are patentably distinguishable over the art cited by the Examiner. Accordingly, Applicants respectfully request that this Board reverse the final rejection of claims 1 – 21.

A check in the amount of $330 for filing a brief in support of this appeal is enclosed herewith. Please charge any deficiency or credit any overpayment pursuant to 37 C.F.R. § 1.16 or § 1.17 to Deposit Account No. 08-0750.

Respectfully submitted,

Dated: 6/8/04

By: _____
Michael D. Wiggins, Reg. No. 34,754
Attorney for Applicants

Harness, Dickey & Pierce, P.L.C.
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Enclosures: Three (3) copies of Appellant's Brief

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APPENDIX

1. A switched reluctance electric machine comprising:

a stator including a plurality of circumferentially-spaced stator segment assemblies that include a stator segment core and winding wire that is precisely wound around individual ones of said stator segment core to provide substantially uniform inductance and resistance characteristics, wherein said windings define a slot fill that is greater than 65%;

a rotor defining a plurality of rotor poles, wherein said rotor tends to rotate relative to said stator to maximize the inductance of an energized winding; and

a sensorless drive circuit that derives rotor position based on parameters that vary with at least one of said substantially uniform inductance and resistance characteristics of said stator segment assemblies and that energizes said winding wire around said stator segment assemblies to control operation of said switched reluctance machine based on said derived position of said rotor.

2. The switched reluctance electric machine of claim 1 wherein said sensorless drive circuit includes an inductance sensor that senses inductance of said winding wire of one of said stator segment assemblies wherein said sensorless drive circuit derives said rotor position from said sensed inductance.

3. The switched reluctance electric machine of claim 1 wherein said sensorless drive circuit includes a diagnostic pulse generator that generates a diagnostic pulse that is output to said winding wire of one of said stator segment assemblies, wherein said

sensorless drive circuit derives said rotor position based on a sensed change in phase current due to said diagnostic pulse.

4. The switched reluctance electric machine of claim 1 wherein said sensorless drive circuit determines rotor position by monitoring a slope of a current waveform related to current flowing in said energized winding and by identifying when said slope is zero.

5. The switched reluctance electric machine of claim 1 wherein said sensorless drive circuit monitors current and flux and employs a look up table to determine said derived position of said rotor.

6. The switched reluctance electric machine of claim 1 wherein said stator segment core includes stator plates with an outer rim section and a tooth section that extends radially inwardly from a center portion of said outer rim section.

7. The switched reluctance electric machine of claim 6 further comprising:

an insulation layer located between said winding wire and said stator segment core.

8. The switched reluctance electric machine of claim 1 further comprising:

projections extending from opposite sides of a radially inner end of said tooth section.

9. The switched reluctance electric machine of claim 8 further comprising:

first and second end caps connected to opposite axial ends of said stator segment core; and

first and second end cap retainer sections that extend adjacent to said projections and that connect said first and second end caps,

wherein said first and second end caps and said first and second end cap retainer sections define an annular retention channel that reduces movement of said winding wire during use and wherein said first and second end caps and said first and second end cap retainer sections are not located between said winding wire and axial side surfaces of said tooth section.

10. The switched reluctance electric machine of claim 6 wherein said stator plates of said stator segment core include radial and lateral slits and first and second central portions that are deformed to hold said stack of stator plates together.

11. A sensorless switched reluctance electric machine comprising:

a stator;

a rotor;

a machine housing;

a plurality of circumferentially-spaced stator segment assemblies that are arranged around an inner surface of said machine housing;

said stator segment assemblies defining a salient stator pole that extends in a radially inward direction;

said stator segment assemblies including a stator segment core and winding wire that is precisely wound around individual ones of said stator segment core to provide substantially uniform inductance and resistance characteristics, wherein said windings define a slot fill that is greater than 65%; and

a sensorless drive circuit that is connected to said winding wire, that derives rotor position based on parameters that vary with at least one of said substantially uniform inductance and resistance characteristics of said stator segment assemblies and that energizes said winding wire around said stator segment assemblies to control operation of said switched reluctance machine based on said derived position of said rotor.

12. The sensorless switched reluctance electric machine of claim 11 wherein said sensorless drive circuit includes an inductance sensor that senses inductance of one of said stator segment assemblies, wherein said sensorless drive circuit derives said rotor position based on said sensed inductance.

13. The sensorless switched reluctance electric machine of claim 11 wherein said sensorless drive circuit includes a diagnostic pulse generator that generates diagnostic pulses that are output to one of said stator segment assemblies, wherein said sensorless drive circuit senses changes in phase current resulting from said diagnostic pulses and derives said rotor position therefrom.

14. The switched reluctance electric machine of claim 11 wherein said sensorless drive circuit determines rotor position by monitoring a shape of a current

waveform related to current flowing in said energized winding and by identifying when said slope is zero.

15. The switched reluctance electric machine of claim 11 wherein said sensorless drive circuit monitors current and flux and employs a look up table to determine said derived position of said rotor.

16. The sensorless switched reluctance electric machine of claim 11 wherein said stator segment core includes stator plates with a radially outer rim section and a tooth section that extends radially inwardly from said radially outer rim section.

17. The sensorless switched reluctance electric machine of claim 16 further comprising:

an insulation layer located between said winding wire and said stator segment core.

18. The sensorless switched reluctance electric machine of claim 16 further comprising:

projections extending from opposite sides of a radially inner end of said tooth section.

19. The sensorless switched reluctance electric machine of claim 18 further comprising:

first and second end caps connected to opposite axial ends of said stator segment core; and

first and second end cap retainer sections that extend adjacent to said projections and that connect inner ends of said first and second end caps,

wherein said first and second end caps and said first and second axial end cap retainer sections define an annular retention channel that reduces movement of said winding wire during use and wherein said first and second end caps and said first and second end cap retainer sections are not located between said winding wire and axial side surfaces of said tooth section.

20. The sensorless switched reluctance electric machine of claim 16 wherein said stator plates of said stator segment core include radial and lateral slits and first and second central portions that are deformed to hold said stator segment core together.

21. A sensorless switched reluctance electric machine comprising:

a machine housing;

a rotor that rotates relative to said machine housing;

a stator that is mounted on an inner surface of said machine housing, said stator including a plurality of circumferentially-spaced stator segment assemblies, wherein said stator segment assemblies include a stack of stator plates forming a stator segment core and winding wire that is precisely wound around individual ones of said stator

segment core to provide substantially uniform inductance and resistance characteristics, wherein said windings define a slot fill that is greater than 65%, and wherein each of said stator plates has a generally "T"-shaped cross-section, a radially outer rim section, and a tooth section that extends radially inwardly from a center portion of said radially outer rim section; and

a sensorless drive circuit that derives rotor position based on parameters that vary with at least one of said substantially uniform inductance and resistance characteristics of said stator segment assemblies and that energizes said winding wire around said stator segment assemblies to control operation of said switched reluctance machine based on said derived rotor position.

22. The sensorless switched reluctance electric machine of claim 21 further comprising:

an insulation layer located between said winding wire and said stator segment cores.

23. The sensorless switched reluctance electric machine of claim 21 further comprising:

projections extending from opposite sides of a radially inner end of said tooth section.

24. The sensorless switched reluctance electric machine of claim 23 further comprising:

first and second end caps connected to opposite axial ends of said stator segment core; and

first and second end cap retainer sections that extend adjacent to said projections and that connect inner ends of said first and second end caps,

wherein said first and second end caps and said first and second end cap retainer sections define an annular retention channel that reduces movement of said winding wire during use and wherein said first and second end caps and said first and second end cap retainer sections are not located between said winding wire and axial side surfaces of said tooth section.

25. The sensorless switched reluctance electric machine of claim 21 wherein said stator plates of said stator segment core include radial and lateral slits and first and second central portions that are deformed to hold said stator segment core together.

26. The sensorless switched reluctance electric machine of claim 21 wherein said sensorless drive circuit includes an inductance sensor that senses inductance of one of said stator segment assemblies.

27. The sensorless switched reluctance electric machine of claim 21 wherein said sensorless drive circuit includes a diagnostic pulse generator that generates diagnostic pulses that are output to one of said stator segment assemblies.